

## REMARKS

Claims 1-26 are pending in this application. Claims 16-23 have been withdrawn from consideration. Claim 26 has been added.

No new matter is introduced by this Amendment, and no new issues are raised thereby. Accordingly, entry of this Amendment, in order to place the application into condition for allowance or into better condition for appeal, is respectfully solicited.

The Examiner has rejected claims 1-15 and 24 as being unpatentable over JP 7-330959 ('959) in view of JP 07292161 ('161). This rejection is respectfully traversed. The arguments presented in the prior Amendment and Supplemental Amendment are incorporated herein by reference. Claim 1 has now been amended to add the limitations of both claim 5 and claim 9, which have both now been canceled. Amended claim 1 now requires that the molecular weight distribution be less than 2.2, thus being distinguished from JP '959 which is directed to a molecular weight distribution of 2.2 to 3.2.

On the other hand, JP '161 is directed to the case where the amount of the modified component is 60% or lower, thus being distinct from the present invention which requires a modified component in an amount exceeding 60 wt.%.

Concerning component (A) as defined in amended claim 1, the following description appears in the specification at page 22, line 17 to page 23, line 2:

"When the polymer has a molecular weight distribution less than 2.2, on the other hand, processability is usually inferior. Particularly when silica is incorporated, the torque upon processing becomes large. In such a case, a large

amount of carbon black was conventionally used in combination. In the invention, affinity with silica is heightened so that even if the amount of carbon black is small, the processability is excellent; the rubber composition thus obtained is well balanced between low rolling resistance and wet skid resistance; and strength properties are improved."

Thus, it is indicated here that the processability, and the balance between low rolling resistance and wet skid resistance and strength properties of the rubber composition, are further improved owing to the feature of the specific molecular weight distribution.

Specifically, Examples 4-1 and 4-2 in Table 10 and Example 9-2 in Table 15 use polymers having different molecular weight distributions, but employ the same formulation. Examples 4-1 and 9-2 in which the molecular weight distribution is less than 2.2 exhibited superior balance between low rolling resistance and wet skid resistance, as compared to Example 4-2 in which the molecular weight distribution is 2.2 or higher (See Fig. A attached hereto).

Furthermore, the compositions using sample Nos. A, B, C, H, J, K, L, M, N and O exhibited the effects of the present invention.

The Examiner asserts in the Office Action that since the prior art (JP '959) teaches a vinyl content of approximately 87% (in Table 1, example H), the addition of approximately 0.87 equivalents of glycidyl compound would have been obvious. From a technical standpoint, JP '959 provides no such teaching, and moreover, the Examiner's understanding is not correct.

In the relevant description, SBR has a styrene content (S) of 14.8 mol% and the vinyl bond amount (V) in the butadiene part is 39.2 mol%. There is no basis to assert that the vinyl content is about 87%, as alleged by the Examiner. In fact, the molar proportion of the butadiene in the polymer is 85.2 mol%. In addition, the Examiner asserts that only the butadiene part of SBR is modified. In the case of using an SBR polymer and carrying out addition or grafting of a functional group by a method such as radical reaction, the proportion of butadiene is important because the functional group is allowed to react with the double bond of butadiene. However, in the present invention, the living ends at the terminals of the SBR polymer react with epoxy groups, and hence there is no relation between the butadiene content and the modification ratio.

In the present invention, the modification ratio of the polymer is increased by a specific method. The modification ratio of the polymer can be determined only by a chromatography analysis as described in the present specification. The present inventors found that compositions employing a polymer having a specific modification ratio have remarkably excellent properties, thus providing the present invention.

Incidentally, example H of JP '959 is a comparative polymer using tin tetrachloride as the coupling agent, and it has nothing to do with the present invention.

Applicants note the following point, in view of the comparisons among samples A, C and D in Table 1 of the present specification. When having the same polymer structure (styrene-butadiene ratio, vinyl content, molecular weight; modifying group) but different modification ratios, the performance is largely improved by a modification ratio exceeding 60% (see Fig. B attached hereto).

An additional point should be noted. In the present invention, it is recommended to carry out kneading with sulfur and a vulcanization accelerator at 120°C or lower. However, vulcanization is conventionally carried out at a higher temperature.

Claim 25 was rejected as being unpatentable over JP 7-330959 ('959) in view of JP 07292161 ('161) as applied to claims 1-15 and 24 above, and further in view of Kitigawa (US4,914,248). This rejection is respectfully traversed.

The feature of the invention of new claim 26 resides in using a polymer in which an unreacted epoxy group exists as the result of reacting the epoxy group of the polyfunctional compound in an amount exceeding one equivalent relative to the active end of the rubbery polymer.

Claim 26 is directed to a preferred composition of the invention described in the paragraph bridging pages 20-21 of the specification. The following description can be found therein;

"By the reaction between the active end of the polymer and epoxy group, a hydroxyl group is introduced into the polymer chain. When the epoxy group of the polyfunctional group exceeds 0.6 equivalent but not greater than 1 equivalent of the active end of the polymer, a large portion of the active end of the polymer reacts with the epoxy group of the polyfunctional compound and causes coupling reaction of plural molecules, resulting in the formation of

a modified polymer molecule having plural hydroxyl groups. When the epoxy group of the polyfunctional group exceeds 1 equivalent of the active end of the polymer, formed are both the polymer molecule having plural hydroxyl groups and a modified polymer molecule - which contains both a hydroxyl group produced by the reaction of the active end of the polymer with the epoxy group and an unreacted epoxy group in the polyfunctional compound molecule bonded to the polymer -."

The lower limit of the amount is supported by the specification at page 20, line 25, and the upper limit is supported by the specification at page 20, line 6.

JP '959 does not disclose the reaction amount ratio of the components to be reacted. Applicants consider that new claim 26, directed to a specific preferred range, is also further distinguished from JP '959 and should be allowable. JP '161 does not provide any relevant description.

Additionally, all of the Examples of Kitagawa (US 4,914,248) are directed to an amount that is not higher than one equivalent. Furthermore, Kitagawa does not disclose the use of silica.

The superior effects of the invention of new claim 26 are as follows. Examples 15-2 (sample BA), 15-4 (sample BB) and 15-6 (sample BD) in Table 21 are examples of compositions using silica where the conditions are the same except for varying the

equivalent ratio of the modifier relative to active lithium. Examples 15-2 (sample BA) and 15-4 (sample BB), in which the amount of the epoxy groups of the polyfunctional compound reacted exceeded one equivalent relative to one mol of the active end, resulted in superior balance between low rolling resistance and wet skid resistance, as compared to Example 15-6 (sample BD) where the amount was 0.95 equivalent (see Fig. C attached hereto).

Further, among Examples 15, 16 and 17, those using samples AA, AB, AC, BA, BB and BC exhibited the effects of the invention.

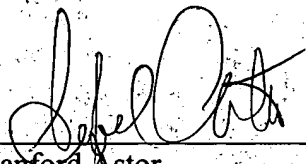
Accordingly, it is submitted that the prior art cited by the Examiner, whether considered alone or in combination, does not teach, disclose or even suggest the presently claimed invention. In view of the amendments and the arguments presented above, it is requested that the amendments to the claims be entered and that the case is now in condition for allowance or better condition for appeal. Early allowance of the claims is respectfully requested.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Sanford Astor (Reg. No. 20748) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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by   
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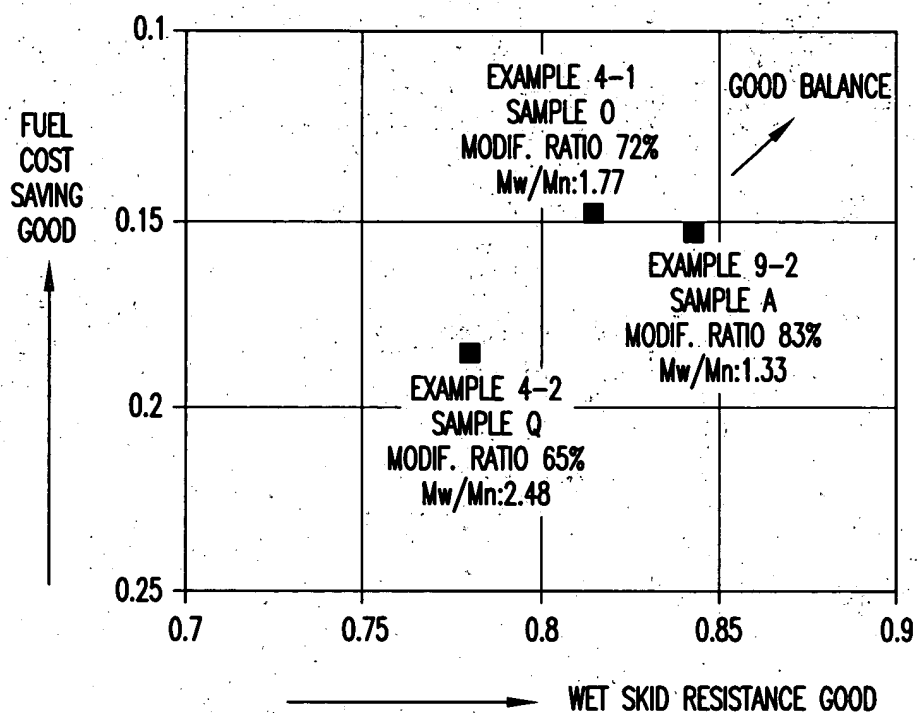
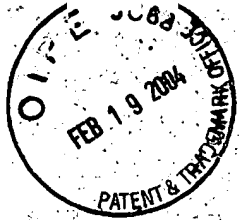


Fig.A



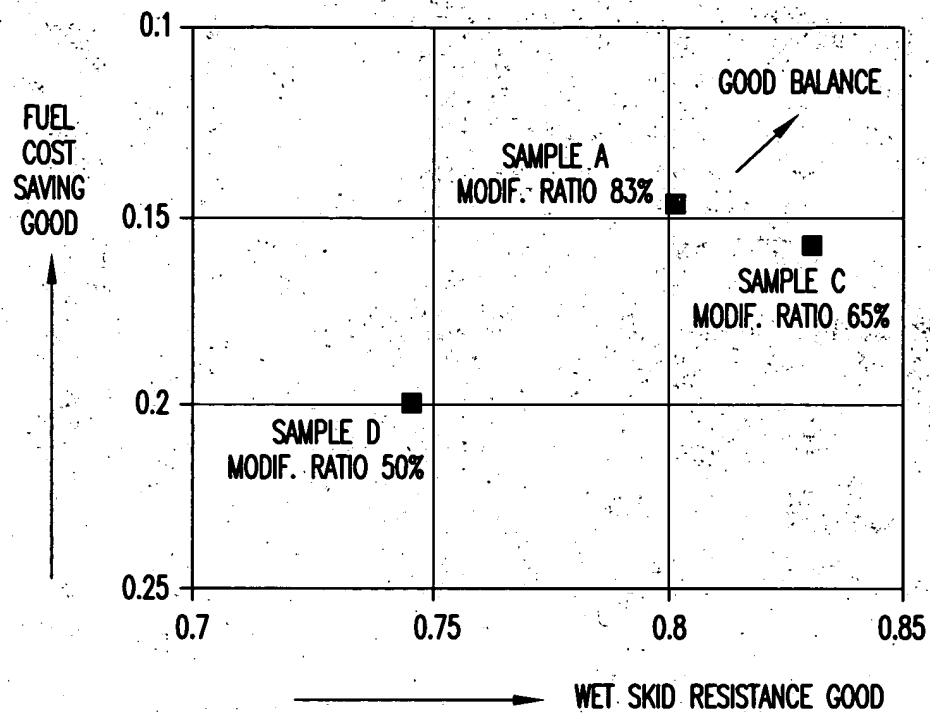


Fig.B

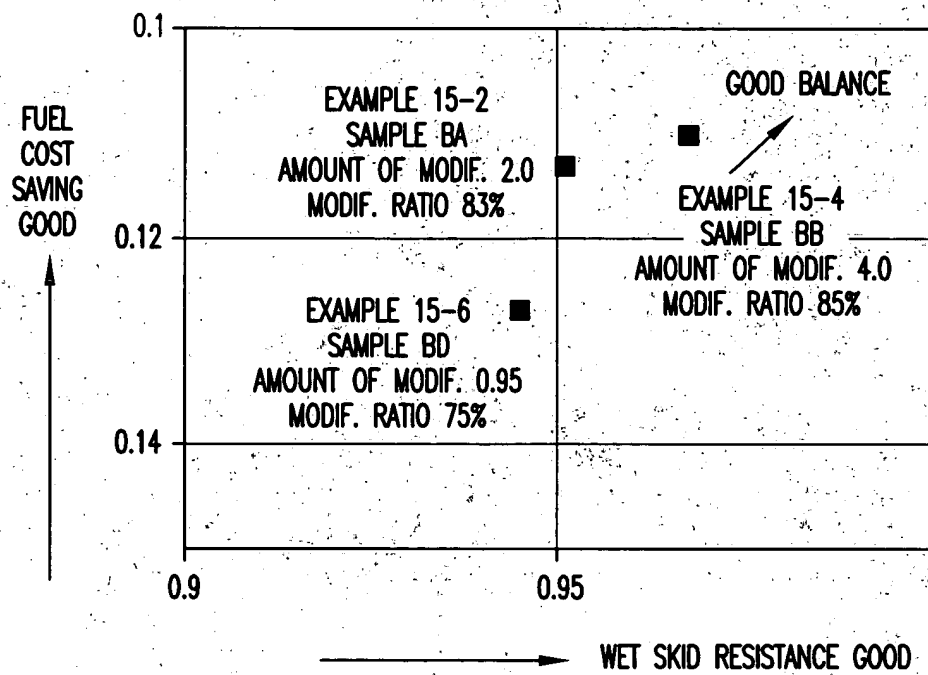
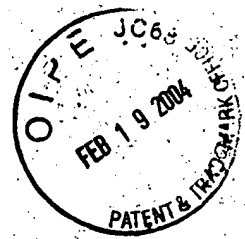


Fig.C